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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/752,798 | 12/28/2000 | Mohamed Arafa | 42390P8119 | 9364 |

8791 7590 01/14/2002

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EXAMINER

MAI, ANH D

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2814

DATE MAILED: 01/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/752,798

Applicant(s)

ARAFAT ET AL.

Examiner

Anh D. Mai

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 20-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. During a telephone conversation with Mr. Michael A. Bernadicou on December 28, 2001 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-19. Affirmation of this election must be made by applicant in replying to this Office action. Claims 20-23 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Drawings

2. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the furnace including the input and output lines, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-14, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chern et al. (U.S. Patent No. 6,150,223) in view of Laxman et al. (U.S. Patent No. 5,976,991).

Chern teaches a method of forming sidewall spacers adjacent opposing vertical sides of a gate electrode substantially similar as claimed including:

forming at least one gate electrode (14s) over a substrate (10);

forming a first silicon oxide film (20s) conformally over the substrate and gate electrode from a combination of gases and oxygen;

forming a silicon nitride film (22s) conformally over the first silicon oxide film from a combination of gases; and

forming a second silicon oxide film (24s) over the silicon nitride film from a combination of gases and oxygen. (See Fig. 4).

Thus, Chern is shown to teach all the features of the claim with the exception of using a specific precursor silane.

However, Laxman teaches an alternative silane precursor such as bis-(tertiarybutylamino)silane (BTBAS) can be used to form silicon oxide and silicon nitride.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the silicon oxide (20s), silicon nitride (22s) and silicon oxide (24s) of Chern using BTBAS as taught by Laxman to avoid Si-C bonds to reduce carbon contamination of the resulting films.

With respect to claim 2, forming the silicon oxide film of Chern in view of Laxman comprises providing one or more wafers in a furnace at first temperature, and flowing BTBAS and oxygen into the furnace.

With respect to claim 3, forming the silicon nitride and the silicon oxide film of Chern in view of Laxman comprises keeping the one ore more wafers in the furnace.

With respect to claim 4, forming the silicon nitride film of Chern in view of Laxman comprises maintaining the one or more wafers in the furnace at a second temperature, and flowing BTBAS and NH_3 into the furnace.

With respect to claim 5, forming the silicon oxide film of Chern in view of Laxman comprises maintaining the one or more wafers in the furnace at the first temperature, and flowing BTBAS and oxygen into the furnace.

With respect to claim 6, the first deposition temperature of Laxman is in the range of 550-625 °C and the second deposition temperature of Laxman is at 600 °C.

With respect to claims 7 and 9, Official Notice is taken regarding purging the furnace prior to forming another different film appears to be within the ability of one having ordinary skill in the art to prevent cross-contamination.

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With respect to claims 8 and 10, Official Notice is taken regarding how purging preformed is within the ability of one having ordinary skill in the art including shutdown all reactant gases follow by introducing inert gas then introducing the new reactant gas.

With respect to claim 11, the process of Chern further includes forming a first sidewalls spacer (See Fig. 5).

With respect to claims 12 and 13, all films of Chern in view of Laxman are deposited in-situ in a first furnace.

With respect to claim 14, the first furnace of Chern in view of Laxman is vertically oriented and the flow of the reactant gases into the furnace from the bottom are well known.

With respect to claim 16, forming of the first sidewall spacer of Chern in view of Laxman comprises anisotropically etching the second silicon oxide film (24s), the silicon nitride film (22s) and the first silicon oxide film (20s).

With respect to claim 17, the process of Chern in view of Laxman further includes removing the second oxide film so as to form L-shaped spacers. (See Fig. 6).

5. Claims 15, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chern '223 and Laxman '991 as applied to claims 11 and 17 above, and further in view of Miles (U.S. Patent No. 6,233,597).

With respect to claims 15 and 18, Chern and Laxman teach all the features of the claim with the exception of explicitly disclosing doping of the substrate to form source/drain region.

However, Miles teaches ion implantation is used to form a deep source/drain region in the substrate adjacent at least two opposing sides of the gate electrode. (See Fig. 3).

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Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form source/drain regions adjacent to the gate of Chern as taught by Miles to reduce source/drain depth adjacent to the gate.

With respect to claim 19, the implanting dopant of Miles includes a partial passage of ions beam through a portion of the L-shaped spacers.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M
December 31, 2001


Olik Chaudhuri
Supervisory Patent Examiner
Technology Center 2800